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POSITION ASSISTED SERVICE SELECTION

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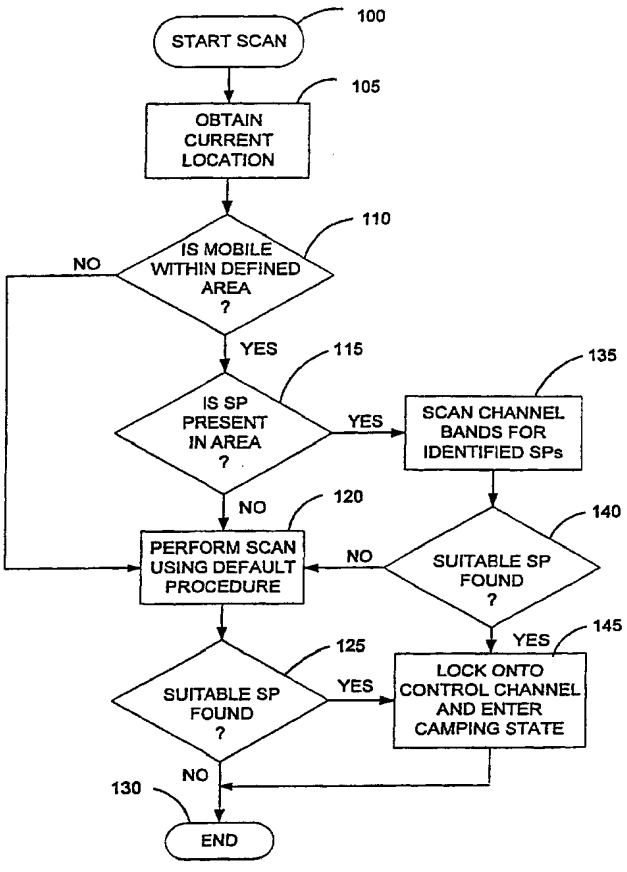

(57) Abstract: A scanning method for a mobile terminal in a mobile communication network uses the current location of the mobile terminal to select frequency bands to be scanned. The mobile terminal includes an enriched database containing area definitions and service provider information corresponding to each area definition. When the scanning procedure is initiated, the mobile terminal compares its current location to the area definitions in the database to determine the frequency bands to be scanned. Thus, the mobile terminal scans first those frequency bands in which a preferred service provider is expected.

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POSITION ASSISTED SERVICE SELECTION

BACKGROUND OF THE INVENTION

The present invention relates generally to service selection and re-selection procedures used by a mobile terminal in a mobile communication network, and more particularly to a scan and lock procedure wherein the search for a suitable control channel is augmented by position information.

Since the initial deployment of cellular communication networks in the early 1980s, the cellular communication industry has experienced an impressive growth rate. The first cellular network implemented in the United States was the AMPS system, which operates in the 850 MHz spectrum. Initially, there were only one or two cellular operators. The number of operators has increased over time as demand for cellular services has increased. The number of operators has been spurred by deregulation of the telecommunications industry. At present, there are numerous competing service providers in virtually all geographic markets.

Since the number of available channels for cellular communications is limited, the available frequencies are allocated among the various service operators (also referred to as service providers) who are in competition with one another. The available channels are grouped together into bands. For example, the 1900 MHz spectrum is divided into six bands, denoted A-F. The frequency bands are allocated as a unit to a single service provider in a given geographic market. However, the same frequency band may be allocated to a different service provider in a different geographic market. Because of the competition among service providers for available spectrum, most service providers do not provide full nationwide coverage.

In order to provide roaming services to its customers, many cellular operators have entered into bilateral agreements with other operators. Pursuant to these bilateral agreements, the customers of operator A can access the network of operator B when roaming outside of the service area of operator A. These bilateral agreements allow service providers to fill in holes in its coverage area to provide regional or nationwide roaming services.

When roaming outside of its home area, the mobile terminal scans the frequency spectrum to search for a suitable control channel on which to acquire service. To facilitate this search, a list of service providers is stored in an Intelligent Roaming Database (IRDB) in the mobile terminal. In the IRDB, the service providers are ranked in order of preference. Usually, the ranking is determined by the home service provider and may be influenced by negotiated roaming rates, available services, and other factors. In general, the mobile terminal will try to obtain service on the highest ranked service provider located during the scanning procedure.

When scanning, the various frequency bands are scanned in a predetermined sequence which is usually determined by the home service provider. In general, the order in which the frequency bands are scanned will be optimized for the customer's home service area. When roaming outside of the home service area, the search order may not be optimum. This can increase the amount of time it takes for the mobile terminal to scan and lock onto a suitable control channel.

The most recently added spectrum allocated in the United States was added to meet increasing demand for cellular services. The relatively new

spectrum, in the 1900 MHz range, is also divided in a plurality of frequency bands. The allocation of additional spectrum provided an opportunity for cellular operators to complement their existing coverage in order to provide full nationwide coverage. Therefore, in order to facilitate roaming within the United States, at least a dual band mobile terminal is needed which scans both the 850 MHz and 1900 MHz spectrums when searching for a control channel.

In Europe, the 900 MHz and 1800 MHz spectrums are currently used. Mobile terminals operating in both the United States and Europe must also be able to operate in those spectrums, in addition to those used in the United States. In the near future, it can be anticipated additional frequency spectrums will be allocated and that triple mode and higher order mobile terminals will become more common. This can significantly increase the amount of time it takes to scan and acquire service on a control channel.

Another factor complicating the scanning process is the number of different technologies employed in the markets. The AMPS system implemented in the United States is an analog system. In order to provide improved services, many cellular operators have begun to implement digital communications networks using digital technology, such as TIA/EIA IS-136, TIA/EIA IS-95, and Global System for Mobile communications (GSM). Also, satellite systems are used by some providers to fill in holes in existing terrestrial networks. Additionally, new technologies are being developed, such as Code Division Multiple Access (CDMA) 2000, Universal Wireless Communications (UWC) 136, and Wideband Code Division Multiple Access (WCDMA). Therefore, when scanning for a control

channel, the mobile terminal must select a service provider that supports the particular technology used by the mobile terminal.

The increasing number of available technologies and frequency spectrums means that it takes longer to scan for an available control channel. Table 1 below shows different frequency spectrums and technologies currently used or being developed.

	Technology						
Freq. spectrum	**ANSI 95**	**ANSI 136**	**GSM**	**CDMA 2000**	**UWC 136**	**WCDMA**	**satellite**
850 MHz	Yes	Yes		Yes	Yes	L	
900 MHz			Yes	P		P	
1800 MHz			Yes	P		P	
1900 MHz	Yes	Yes	Yes	Yes	Yes	Yes	
2000 MHz	P	P	P	L	P	Yes	
2100 MHz							Yes

In Table 1, "L" means future implementation of the technology is likely, and "P" means future implementation of the technology is possible. As new frequency spectrums are allocated and new technologies are developed, there may be significant delays while the mobile terminal searches for a suitable control

channel. This can be annoying to the end user and even more serious when an emergency call is being placed.

Accordingly, there is a need for new scanning and locking methods that reduce the amount of time it takes to acquire service for mobile terminals capable of operating in multiple modes or spectrums.

SUMMARY OF THE INVENTION

The present invention relates to procedures implemented in a mobile terminal in a mobile communication network for selecting service. The service selection procedure can be used when the mobile terminal is powered up, or for re-selections after service is obtained. When a service selection or re-selection procedure is initiated, the mobile terminal determines its current location. The current location can be determined by means of a Global Positioning System (GPS) receiver or other position estimating device in the mobile terminal, or by receiving position information over the air interface from the network, or a combination thereof. The current location of the mobile terminal is compared to area definitions stored in a service provider database in the mobile terminal. The database also includes a list of service providers corresponding to each area definition. If the mobile terminal is within a service area defined in the database, the mobile terminal can look up the service provider information for that area. The service provider information may include, for example, the identification code for the service provider and the frequency band of the service provider. The mobile terminal then scans the frequency band for the service provider that is indicated by the database. If a suitable channel is found, the mobile terminal locks onto the channel and enters the camping state. If a suitable channel is not found, the mobile terminal scans the remaining frequency bands according to default procedures established by the home service provider.

In another aspect of the present invention, the service provider database can store the type of technology supported by the service provider in a specific area. An operator may support different technologies in different areas. In mobile terminals with two or more operating modes, the mobile terminals can "look up" the operating mode for preferred service providers in the area and switch modes when a more preferred service mode is available. In satellite capable mobile terminals, the mobile terminal can switch to satellite mode in areas where service is not otherwise available.

By using position information, the mobile terminal avoids scanning frequency bands where no service is available. Also, the mobile terminal can determine, prior to scanning, what services are expected in the area and, using such information, find the best available service.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a schematic diagram of a wireless communications network.

FIGURE 2 is a block diagram of a mobile terminal used in the wireless communication network of Figure 1.

FIGURE 3 is an example of a typical communication spectrum organization showing frequency bands and corresponding channel numbers for an exemplary technology.

FIGURE 4 is a flow diagram illustrating the scanning and locking procedure of the present invention.

FIGURE 5 is a flow diagram of an alternate scanning and locking procedure of the present invention for a mobile terminal having a satellite mode.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, the service selection method of the present invention will be described. The service selection method of the present invention is used in a mobile communication network shown schematically in Figure 1. The mobile communication network, which is indicated generally by the numeral 10, comprises a plurality of base stations 12 which are connected via a mobile services switching center (MSC) 14 to a terrestrial communications network, such as the Public Switched Telephone Network (PSTN) 18. Each base station 12 is located in, and provides service to, a geographic region referred to as a cell. In general, there is one base station 12 for

each cell within a given network 10. Within each cell, there may be a plurality of mobile terminals 20 that communicate via radio link with the base station 12. The base station 12 allows the user of the mobile terminal 20 to communicate with other mobile terminals 20, or with users connected to the PSTN 18. The MSC 14 routes calls to and from the mobile terminal 20 through the appropriate base station 12. Information concerning the location and activity status of mobile terminals 20 is stored in a Home Location Register (HLR) 15 and a Visitor Location Register (VLR) 17, which are connected to the MSCs 14. Other network architectures are possible. In particular, networks providing packet data services such as General Packet Radio Services (GPRS) may use the service selection method of the present invention.

Figure 2 is a block diagram of a typical mobile terminal 20. The disclosed embodiment of the mobile terminal 20 is a fully functional cellular telephone, such as a TIA/EIA-136 compliant cellular telephone, capable of transmitting and receiving signals. The mobile terminal 20 includes a main control unit 22 for controlling the operation of the mobile terminal 20 and a memory 24 for storing control programs and data used by the mobile terminal 20 during operation. Input/output circuits 26 interface the main control unit 22 with keypad 28, display 30, audio processing circuits 32, receiver 38, transmitter 40, and GPS receiver 50. The keypad 28 allows the operator to dial numbers, enter commands, and select options. The display 30 allows the operator to see dialed digits, stored information, and call status information. The audio processing circuits 32 provide basic analog audio outputs to a speaker 34 and accept analog audio inputs from a microphone 36. The receiver 38 and transmitter 40 receive and transmit signals using shared antenna 44.

The GPS receiver 50 enables the mobile terminal 20 to determine its current location based on positioning signals transmitted by a GPS satellite. In the disclosed embodiment, the GPS receiver 50 includes a separate antenna 52, however, the GPS receiver 50, the receiver 38, and transmitter 40 could use a shared antenna. Also, in lieu

of GPS receiver 50, the mobile communication network 10 could determine the location of the mobile terminal 20 and transmit the location to the mobile terminal 20.

Mobile terminals 20 communicate with the base station 12 using a communications channel. The term channel can have various meanings depending on the context. In general, an RF channel refers to a single allocation of a continuous spectrum. In AMPS and TIA/EIA-136 systems, a RF channel is a 30 kHz allocation in the 850 MHz band or the 1900 MHz band. In GSM, a RF channel is a 200 kHz allocation in the 900 MHz or 1950 MHz bands. The term channel may also refer to an information channel (control channel or traffic channel) in a Time Division Multiple Access (TDMA) or Code Division Multiple Access (CDMA) system. In a TDMA system, an information channel comprises one or more time slots on an RF channel that are allocated to a mobile terminal 20 for transmitting and receiving. In a CDMA system, an information channel is distinguished by an unique coding scheme that further subdivides the RF channel. For purposes of this application, the term "communications channel" or "channel" will generally refer to an information channel, which could be the same as a RF channel in some systems.

The communications channels used in a wireless communications network are grouped into frequency bands, which are then allocated among the competing service providers. By way of example, the spectrum of Figure 3 represents the 1900 MHz spectrum of the TIA/EIA-136 standard and is illustrative of a common method of structuring a communications spectrum. The 1900 MHz spectrum is divided into six frequency bands (A-F). Each frequency band comprises of a plurality of communications channels. As shown in Figure 3, each

communications channel has an identification number and is composed of a specific mobile terminal-base station frequency pair. Also, as shown in Figure 3, each communications channel is assigned to a specific frequency band.

The frequency bands are allocated as a whole to various service providers in a given area such that only one service provider is responsible for providing service on all the communications channels in any given frequency band in a given area. Thus, service provider Alpha in a certain region may be allocated frequency bands A and C, while service provider Beta may be allocated frequency band B, and service provider Gamma all other frequency bands. In a different area, the allocations may be different. Each frequency band typically includes both control channels and traffic channels, with the particular assignment of a given communication channel to these categories possibly changing from one service provider to another and/or from area to area. In addition, different frequency bands may include different quantities of control channels and traffic channels.

When the mobile terminal 20 is powered on, it performs for some technologies a procedure called a scanning and locking procedure. The purpose of the scanning and locking procedure is to find a suitable control channel on which to acquire service. Suitability for camping includes both signal strength requirements and service requirements. Once a suitable control channel is found, the mobile terminal 20 locks onto the channel and enters what is called a camping state on the control channel. The camping state is an idle state during which the phone monitors the control channel for signaling messages, such as a paging message. After service is acquired, the mobile terminal 20 may initiate a re-selection procedure to see if a more preferred service is available. A re-selection procedure may be done periodically or may be triggered by

some event, such as movement of the mobile terminal 20 between cells in the mobile communication network 10.

The scanning and locking procedures used for power-up scan and re-selection are well-known in the art and described in detail in TIA/EIA -136, which is incorporated herein by reference. The details of the scanning algorithm may vary somewhat depending on operating mode (e.g., analog vs. digital) and frequency band. In general, the mobile terminal 20 scans through the frequency bands in a predetermined sequence to find control channels that are suitable for camping. A control channel is considered suitable for camping if it meets certain signal strength and service determination requirements. The mobile terminal 20 uses service provider identification codes to either accept or reject services offered by specific service providers. The service provider identification codes are transmitted by the service provider on the control channel to enable mobile terminals 20 to identify the service provider. When scanning, the mobile terminal 20 reads the service provider identification codes from the control channel and, based at least in part on the code, determines whether to acquire service with that particular service provider.

The mobile terminal 20 includes a database, referred to herein as a service provider database, ranking the service providers (SP) in order of preference. In TIA/EIA-136 systems this database is called the Intelligent Roaming Database (IRDB). The service provider database contains the service provider identification codes and priority data for known SPs. In TIA/EIA-136, service providers are classified as a home SP, partner SP, favored SP, neutral SP, or forbidden SP. The home SP is the subscriber's home service provider. A partner SP is a service provider with which the home provider has negotiated for preferential service and/or rates. Home and partner SPs are referred to as acceptable SPs and have a higher priority than favored or neutral SPs. A favored SP is similar to a partner SP, but its service area overlaps with the Home SP. A neutral SP is an SP that is not otherwise classified (i.e. not defined in the IRDB). A forbidden SP

is one that should never be used, except in the case of an emergency. The mobile terminal 20 identifies the SPs by scanning the frequency bands and searching for control channels with SP information matching the codes programmed into the IRDB.

The IRDB is commonly stored in semi-permanent memory 24 in the mobile terminal 20. For initial activation, the IRDB is either programmed manually, or downloaded over the air using the IRDB Over-the-Air Programming Teleservice (OPTS). In addition, the IRDB may be periodically updated via the OPTS, which may be either a point-to-point or a broadcast teleservice. The IRDB may also reside on a smart card (not shown).

The ultimate object of the scanning and locking procedure is to identify and register with an acceptable, favored, or neutral SP as quickly as possible. Therefore, the IRDB typically includes, in addition to service provider identification data and priority data, a band search list. The band search list is an ordered list of frequency bands and specifies the order in which the frequency bands are to be searched. Usually, the band search list is optimized so that the first frequency bands searched are those allocated to the home SP and partner SPs in the subscriber's home service area. During the scanning and locking procedure, the mobile terminal 20 will acquire service on the first suitable control channel found. Due to the search order specified by the band search list, it is most likely that service will be with the home SP or a partner SP. Thus, preference is given to those frequency bands owned by home and partner service providers.

Unfortunately, when the mobile terminal 20 is roaming outside of its home service area, there may not be a suitable control channel in the first, or first several frequency bands in the band search list. This means that the mobile terminal 20 will unnecessarily spend time searching through frequency bands when no service is available in those bands.

The present invention solves this problem by using an enriched service provider database containing area definitions. An area definition comprises geographic data

describing the service area of a service provider. Service provider identification codes are associated with the area definitions so that the mobile terminal 20 can determine the available service providers operating in specific geographic areas. The database also contains the corresponding frequency band for the service providers in that area. Other information that can also be included, though not strictly necessary, includes the likely location of the control channel (probability blocks) and emergency calling numbers. The end result is a virtual map describing the service areas of service providers defined in the database. Using the enriched database, the mobile terminal 20 can determine whether a suitable service provider is available in a particular geographic area, and in a frequency band usable by the mobile terminal 20, without scanning by comparing its current geographic location to the area definitions stored in memory. If the area is serviced by an acceptable SP, the mobile terminal 20 can alter the search order mandated by the band search list, searching first in the frequency band of the matching SP. If the database indicates that no service is available in the area, the mobile terminal 20 can switch to satellite mode if supported, or some other operating mode.

Figure 4 is a flow diagram illustrating one embodiment of the scanning and locking procedure of the present invention. The scanning and locking procedure shown in Figure 4 can be used as a power-up scanning procedure or re-selection procedure. When the mobile terminal 20 initiates a scan (block 100), the mobile terminal 20 obtains its current location (block 105). The current location can be obtained in several ways. In a preferred embodiment of the invention, the mobile terminal 20 includes a GPS receiver 50 or other position estimating device, that derives the current location from a transmitted signal. Alternately, the position of the mobile terminal 20 can be determined by the network 10 using known position estimating techniques and transmitted to the mobile terminal 20 on a predetermined channel, or the position of the base station can be transmitted and used as an estimator of the position of the mobile terminal 20. Also, the mobile terminal 20 may store its last known location in memory 24 and use the last known location as a

proxy for its current location until more current information is obtained. It should be appreciated that the mobile terminal 20 may additionally request an update of the current location on all the location providing systems described herein.

After obtaining its current location (block 105), the mobile terminal 20 compares the current location to the area definitions in the enriched intelligent roaming database (block 110). If the current location of the mobile terminal 20 is not within an area defined in the database, the mobile terminal 20 performs, by default, the scanning procedures defined in TIA/EIA-136 or other default procedures defined by the operator (block 120). If a suitable control channel is found (block 125), the mobile terminal 20 locks onto the control channel and enters the camping state (block 145). If no suitable channel is found (block 125), the procedure terminates (block 130) without acquiring service.

If the current location is within an area defined in the enriched intelligent roaming database (block 110), the mobile terminal 20 then determines whether there is a suitable SP within the area (block 115). If not, the mobile terminal 20 performs the default scan (block 120). If a suitable service provider is within the area (block 115), the mobile terminal 20 determines the frequency bands for the matching SP(s) in the IRDB and scans those frequency bands for a suitable control channel (block 135). Assuming that the IRDB is updated, the mobile terminal 20 should find a suitable control channel. If more than one service provider is in the area, the frequency bands corresponding to those service providers are searched in the order of the service provider's priority. That is, the frequency bands belonging to acceptable service providers are searched before bands belonging to favored and neutral service providers.

When a control channel is found, the mobile terminal 20 determines whether the channel is suitable for camping (block 140). An important criteria in determining suitability for camping is received signal strength. Also, the service provider must support the technology used by the mobile terminal 20. Other factors may also be considered in determining suitability for camping. If a suitable channel is found (block 140), the mobile

terminal 20 then locks onto the first control channel found that is suitable and enters the camping state (block 145). If no suitable control channel is found, the mobile terminal 20 then performs default scanning procedures (block 120). In this case, the mobile terminal 20 could be programmed to skip the control channels already searched during the first part of the scanning procedure.

In order to speed up the scanning and locking procedure, the available channels in a particular frequency band may be grouped into probability blocks with a ranked order of probability of finding a control channel. A procedure for grouping control channels into probability blocks is described in U.S. Patent No. 5,970,057 which is incorporated herein by reference.

In a satellite-capable mobile terminal, the procedure shown in Figure 4 can be modified so that the mobile terminal 20 switches to satellite mode when the area is not defined (block 110) or the database does not include an SP for the area (block 115). Referring now to Figure 5, when the mobile terminal 20 starts the procedure (block 200), it obtains its current location as previously described (block 205). Next, the mobile terminal 20 determines whether the current location is within an area defined in the IRDB (block 210). If not, the mobile terminal 20 switches to satellite mode (block 220). If the mobile terminal 20 is within a defined area (block 210), the mobile terminal 20 then determines whether there is a suitable SP within the area (block 215). If not, the mobile terminal 20 switches to satellite mode (block 220). If a service provider is within the area, the mobile terminal 20 determines the frequency band for the matching service provider(s) and searches those frequency bands (block 235). When a control channel is found, the mobile terminal 20 determines whether it is suitable for camping (block 240). If so, the mobile terminal 20 locks onto the control channel and enters the camping state (block 245) and terminates the procedure (block 230). If no suitable control channel is found in the frequency bands identified in the IRDB, the mobile terminal 20 switches to satellite mode (block 220) and the procedure ends (block 230).

The amount of memory 24 needed to practice the invention will depend on the extent of the area covered and the resolution of the sub-areas defined in the database. As memory technology advances, concerns about the amount of memory will disappear. Thus, it is expected that the area definitions may extend throughout the entire world. If memory requirements are a concern, an adaptive scheme can be employed wherein information about areas not visited can be discarded. The memory made available by discarding information concerning unvisited areas can then be used to store higher resolution data for the remaining areas, or some other area not already defined in the database. This new information may be downloaded from the mobile communication network 10 or entered by the end user through an application program in a personal computer which interfaces with the mobile terminal 20. Alternately, the information can be downloaded using the OPTS teleservice previously described. Using an adaptive scheme, the mobile communication network 10 can determine the areas previously visited by the subscriber from a call history list. The mobile communication network 10 can then tailor the area definitions according to past use and memory constraints of the particular mobile terminal 20.

One advantage of the present invention is that it avoids the need to scan frequency bands where service is not available or not supported by the mobile terminal. However, the time needed to estimate accurately the current location can, in certain circumstances, increase the time it takes for the mobile terminal 20 to lock onto a control channel. As positioning technology improves, the time needed to ascertain the current location of the mobile terminal 20 will be reduced as more powerful signal processors become available. Further, even if the present invention does not save time needed for scanning during power up in a first generation implementation, it can still result in significant time savings during channel re-selection. As previously indicated, once the mobile terminal 20 locks onto a control channel, certain events may cause the mobile terminal 20 to initiate a channel re-selection procedure. For example, channel re-

selection will be triggered when the mobile terminal 20 moves between cells or when the signal strength on the current control channel becomes weak. Further, the mobile terminal 20 normally re-scans periodically to determine whether a more preferred service is available. That is, if the mobile terminals obtain service with a favored or neutral service provider, the mobile terminal 20 will periodically re-scan to see if service can be obtained with a higher ranked provider. The present invention can thus be used to advantage in any re-scanning or re-selection procedure.

The present invention may, of course, be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

CLAIMS

What is claimed is:

1. A method for selecting a service provider by a mobile terminal, said method comprising:

storing service provider data for a plurality of service providers in said mobile terminal, said service provider data including service area data describing at least one service area for at least one of said plurality of service providers;

determining a current geographic location of said mobile terminal; and

selecting a service provider based on said current geographic location of said mobile terminal and said service area data stored in said mobile terminal.

2. The method according to claim 1 wherein said service provider data stored in said mobile terminal further includes technology type data indicating the type of communication technology supported by said at least one service provider in said at least one service area.

3. The method of claim 2 wherein said selecting a service provider is further based on said technology type data.

4. The method according to claim 1 wherein said service provider data stored in said mobile terminal further includes service provider priority data for said at least one service provider.

5. The method of claim 4 wherein said selecting a service provider is further based on said service provider priority data.

6. The method according to claim 1 wherein said service provider data stored in said mobile terminal further includes service provider identification data for said at least one service provider.

7. The method according to claim 1 wherein said service provider data stored in said mobile terminal includes frequency band data indicating the frequency band of said at least one service provider in said at least one service area.

8. The method according to claim 1 wherein said service provider data stored in said mobile terminal includes control channel data indicating at least one control channel frequency of said at least one service provider in said at least one service area.

9. The method of claim 1 wherein said storing service provider data includes storing said service provider data in a removable memory device associated with said mobile terminal.

10. The method according to claim 1 wherein said determining a current geographic location of said mobile terminal includes receiving a transmission from a remote location containing data representing said current geographic location.

11. The method according to claim 1 wherein said determining said current geographic location of said mobile terminal includes transmitting a request and receiving a transmission responsive to said request containing data representing said current geographic location.

12. The method of claim 11 wherein said transmitting a request comprises said mobile terminal transmitting said request to a serving base station and

wherein said receiving a transmission responsive to said request comprises said mobile terminal receiving a responsive transmission from said base station.

13. The method according to claim 1 wherein said determining said current geographic location of said mobile terminal includes determining said current geographic location based on signals received by a positioning receiver in said mobile terminal.

14. The method of claim 1 further including updating said service area data stored in said mobile terminal based on areas visited by said mobile terminal.

15. The method of claim 14 further including storing said areas visited by said mobile terminal in a history list in a mobile communication network.

16. The method of claim 14 further including storing said areas visited by said mobile terminal in a history list in said mobile terminal.

17. A wireless communications mobile terminal, comprising:

a transceiver for transmitting and receiving RF signals over a plurality of communication channels;

memory including a service provider database, said service provider database including a list of service providers and service area data describing at least one service area of at least one of said service providers; and

control logic operatively connected to said transceiver and said memory and adapted to select a service provider based on said service area data in said service provider database.

18. The mobile terminal according to claim 17 further including a position estimating device in communication with said control logic, said position

estimating device determining the current geographic location of said mobile terminal, wherein said control logic selects a service provider by comparing said current geographic location of said mobile terminal with said service area data.

19. The mobile terminal according to claim 18 wherein said position estimating device includes a GPS receiver.

20. The mobile terminal according to claim 17 wherein said service provider database includes technology type data indicating the type of communication technology supported by said at least one service provider.

21. The mobile terminal according to claim 17 wherein said mobile communication device has a plurality of operating modes.

22. The mobile terminal according to claim 21 wherein at least one operating mode is a digital operating mode.

23. The mobile terminal according to claim 22 wherein one of said operating modes is satellite mode.

24. The mobile terminal according to claim 17 wherein said memory is selected from a group consisting of random access memory resident in said mobile terminal, a removable memory device selectively attached to said mobile terminal, and a smart card.

25. The mobile terminal according to claim 17 wherein said transceiver receives an indication of said mobile terminal's current geographic location from a mobile communication network and wherein said control logic is adapted to select a service provider based on said service area data in said service provider database and said indication.

26. A method for selecting a control channel by a mobile terminal, said method comprising:

storing service provider data for a plurality of service providers in said mobile terminal, said service provider data including service area data indicative of at least one service area of said at least one service provider and corresponding channel band data indicative of at least one channel band associated with said at least one service provider in said at least one service area;

determining the current geographic location of said mobile terminal;

selecting one or more of said channel bands based on a comparison of said current geographic location and said service area data; and

scanning said selected channel bands.

27. The method of claim 26 wherein said selecting one or more of said channel bands includes:

determining, based on said service area data, a group of available service providers providing service to said current geographic location of said mobile terminal;

selecting one or more of said available service providers; and

for each available service provider selected, determining a channel band associated with said available service provider based on said channel band data.

28. The method of claim 27 wherein said service provider data stored in said mobile terminal includes service provider priority data.

29. The method of claim 28 wherein said selecting one or more of said available service providers is based on said service provider priority data.

30. The method of 28 wherein said scanning said selected channel bands comprises scanning channel bands in sorted order based on said service provider priority data.

33. A method for selecting a control channel by a mobile terminal, said method comprising:

determining a current geographic location of said mobile terminal;

selecting, and thereafter scanning, one or more channel bands based on said current geographic location until a suitable control channel is found.

34. A method for selecting a service provider by a mobile terminal having a plurality of operating modes, wherein one of said operating modes is a satellite mode, said method comprising:

storing service provider data for a plurality of land-based service providers in said mobile terminal, said service provider data including service area data indicative of at least one service area of said at least one land-based service provider;

determining the current geographic location of said mobile terminal; and

selecting an operating mode based on a comparison of said current geographic location with said service area data.

35. The method of claim 34 wherein said selecting an operating mode includes selecting said satellite mode when said current geographic location is not within any of said at least one service areas.

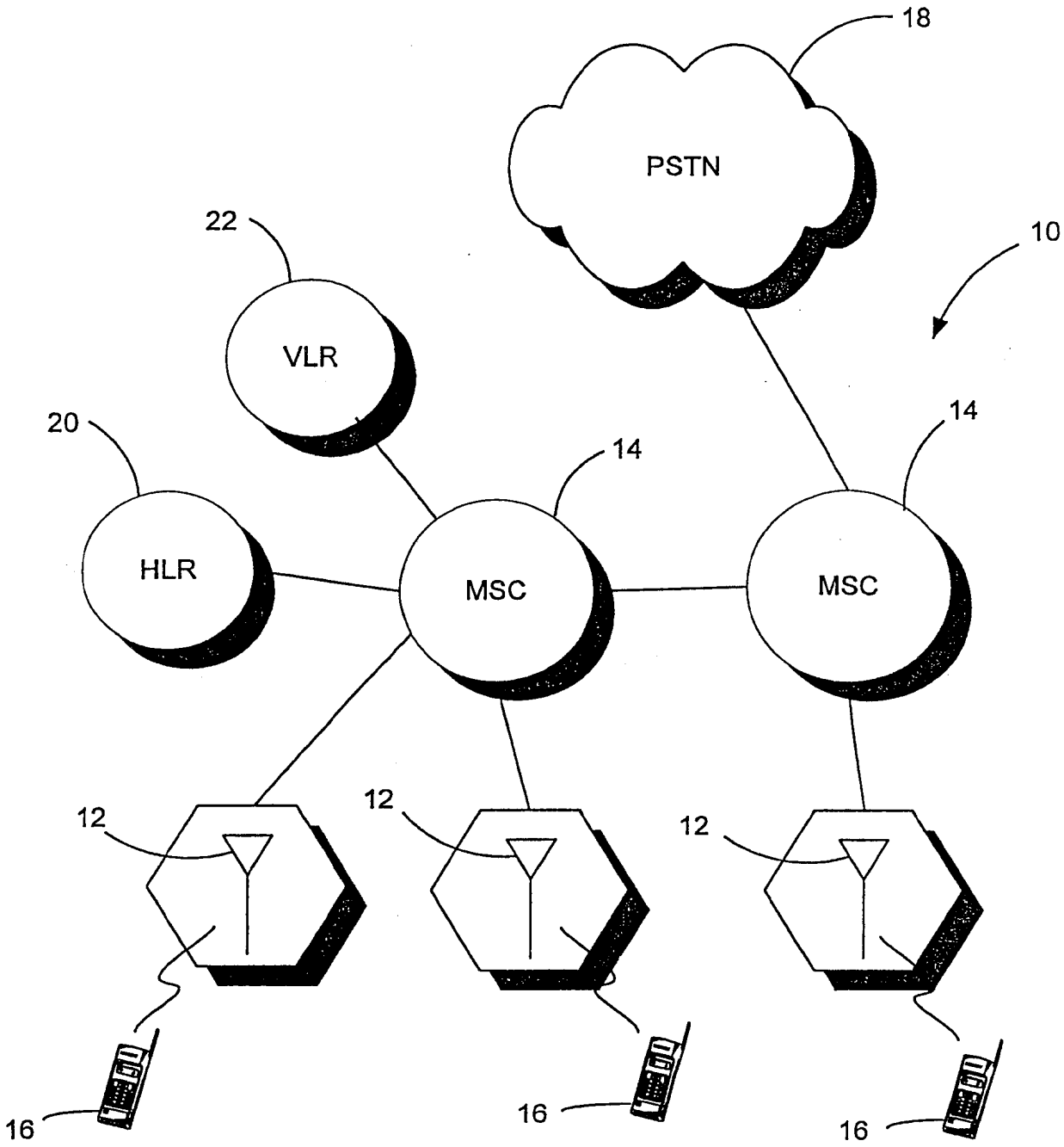

FIG. 1

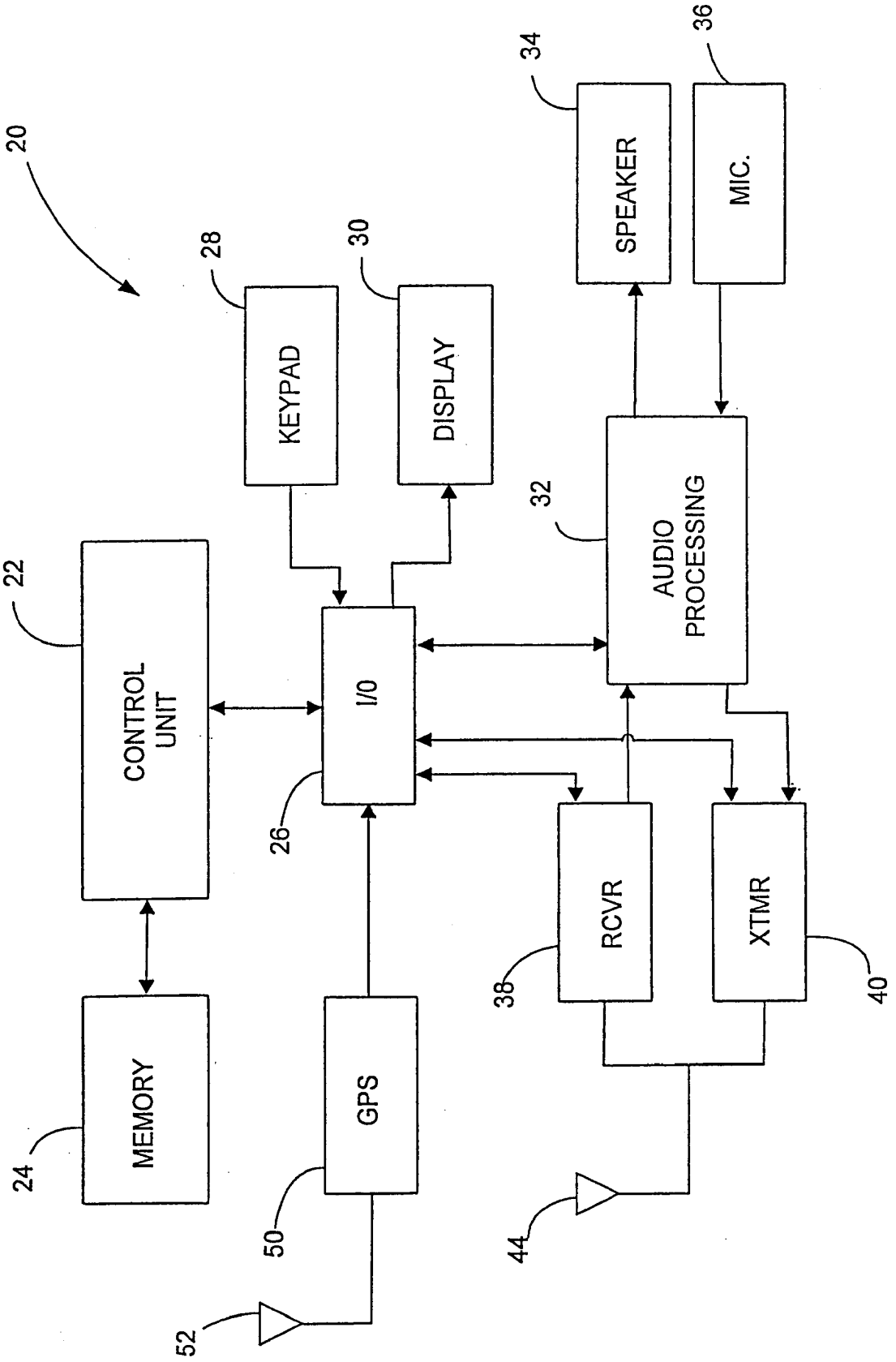
20
28
KEYPAD
30
DISPLAY
34
SPEAKER
36
MIC.
22
CONTROL UNIT
I/O
26
32
AUDIO PROCESSING
RCVR
38
XTMR
40
MEMORY
24
GPS
50
52
44

FIG. 2

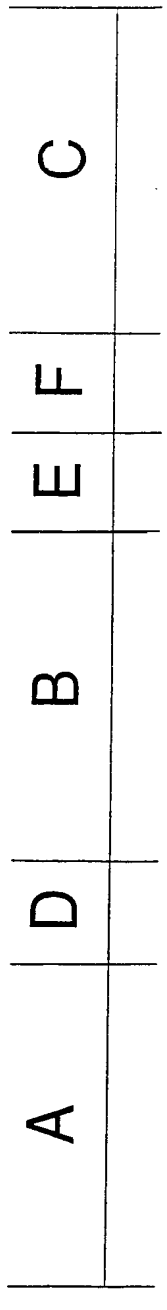
A
D
B
E
F
C
1
500
666
1166
1333
1500
1999
Channel
1850
1865
1869
1884
1890
1895
1910
Mobile Unit Frequency (MHz)
1930
1945
1950
1965
1970
1975
1990
Base Station Frequency (MHz)

FIG. 3

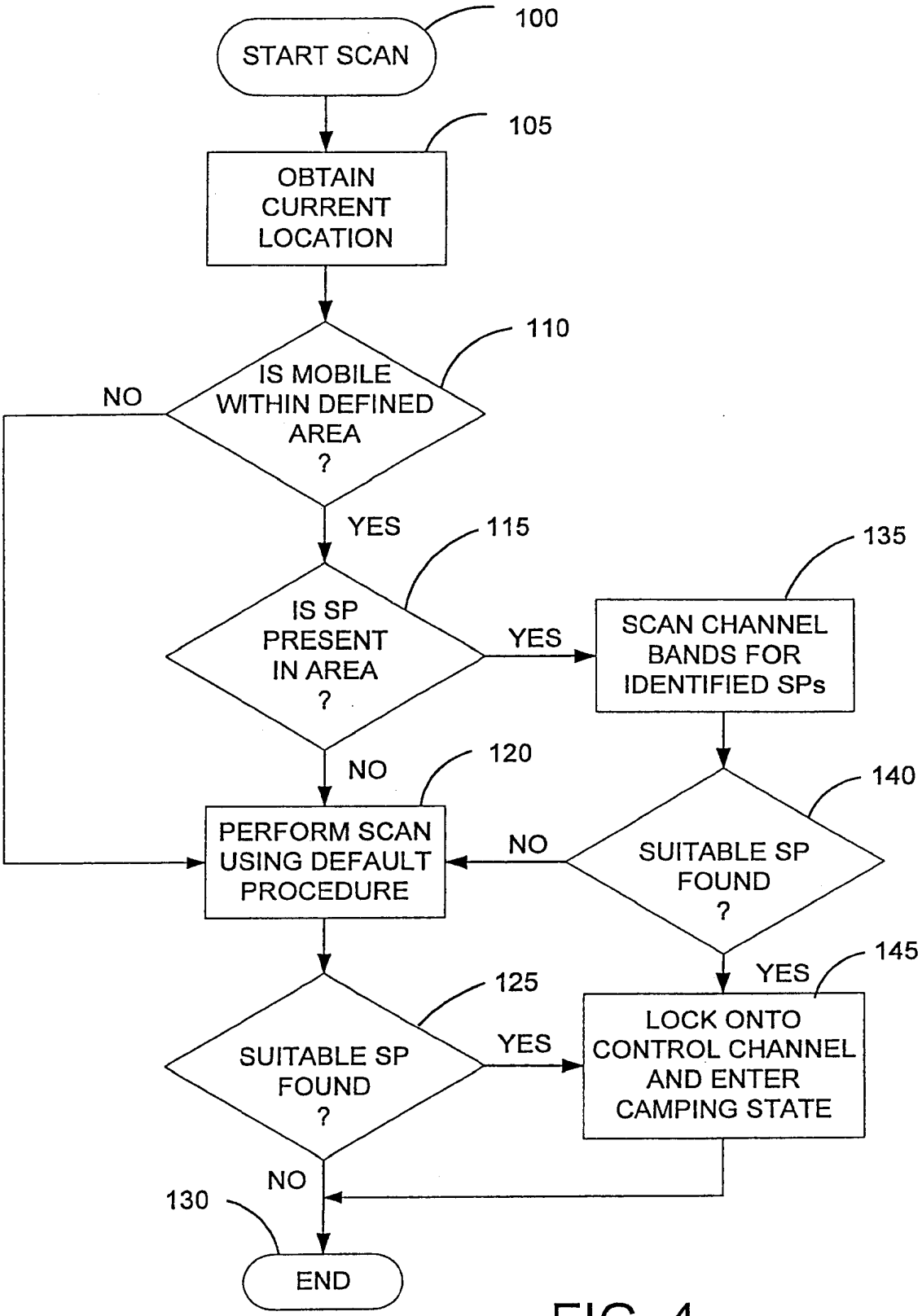
START SCAN
100
OBTAIN CURRENT LOCATION
105
IS MOBILE WITHIN DEFINED AREA ?
110
NO
YES
IS SP PRESENT IN AREA ?
115
YES
SCAN CHANNEL BANDS FOR IDENTIFIED SPs
135
NO
120
PERFORM SCAN USING DEFAULT PROCEDURE
NO
SUITABLE SP FOUND ?
140
YES
145
SUITABLE SP FOUND ?
125
YES
LOCK ONTO CONTROL CHANNEL AND ENTER CAMPING STATE
NO
130
END

FIG. 4

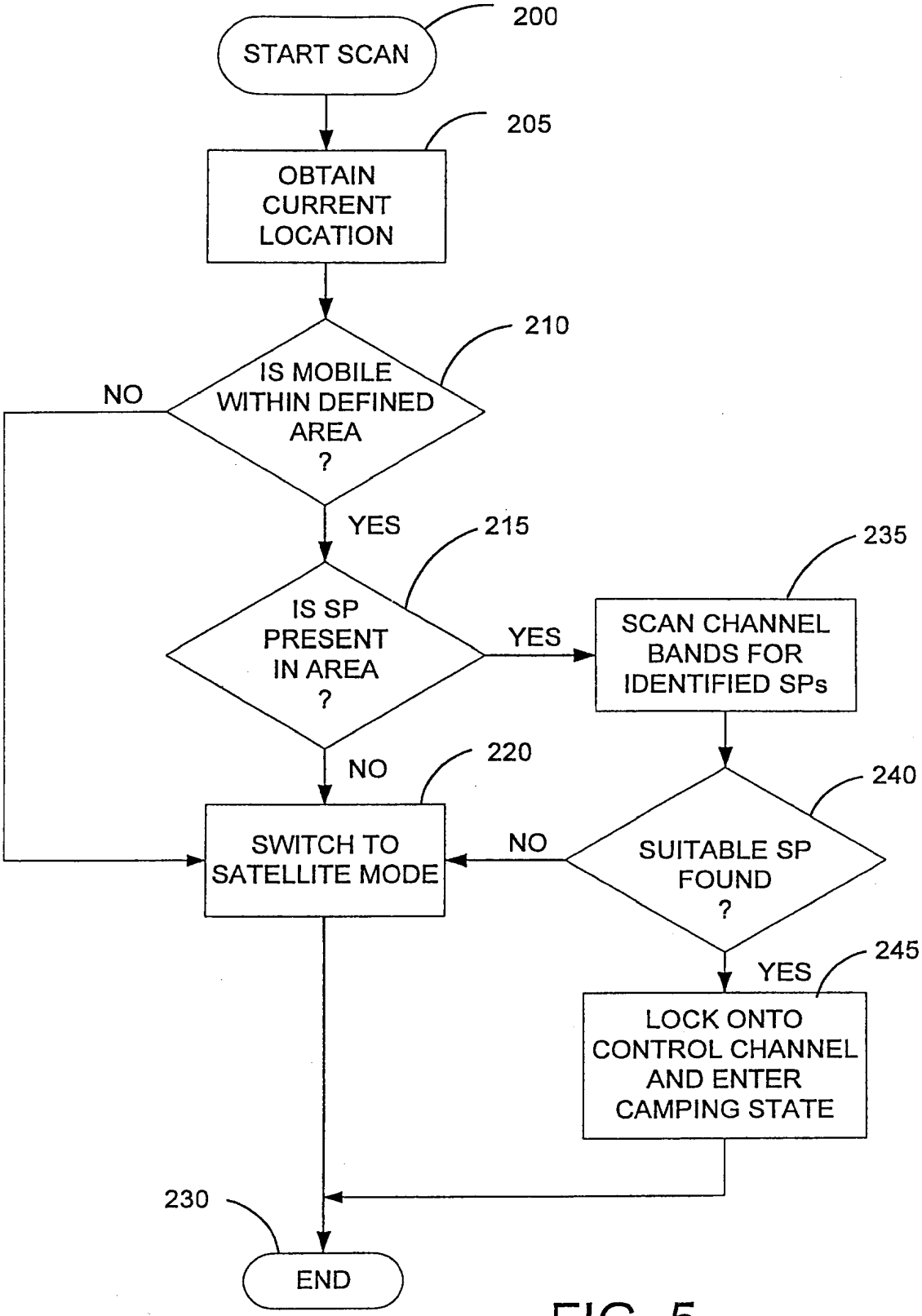
START SCAN
200
OBTAIN CURRENT LOCATION
205
IS MOBILE WITHIN DEFINED AREA ?
210
NO
YES
IS SP PRESENT IN AREA ?
215
YES
SCAN CHANNEL BANDS FOR IDENTIFIED SPs
235
NO
220
SUITABLE SP FOUND ?
240
NO
SWITCH TO SATELLITE MODE
YES
LOCK ONTO CONTROL CHANNEL AND ENTER CAMPING STATE
245
230
END

FIG. 5

INTERNATIONAL SEARCH REPORT

Inter ional Application No
PCI/US 01/02263

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 974 328 A (LEE WILLIAM CHIEN-YEH ET AL) 26 October 1999 (1999-10-26)	1-10, 14-18, 20-22, 24-30,33
Y	column 2, line 23 - line 34 column 3, line 6 - line 26 column 6, line 28 - line 39 column 7, line 5 - line 42 column 7, line 45 -column 8, line 15	11-13, 19,23, 34,35
Y	WO 98 20698 A (QUALCOMM INC) 14 May 1998 (1998-05-14) page 2, line 30 -page 4, line 14 page 5, line 38 -page 6, line 5 page 7, line 11 - line 15 page 11, line 7 - line 18	13,19, 23,34,35

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 May 2001	23/05/2001

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Inter ional Application No
PCT/US 01/02263

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 98 59506 A (TELIA AB) 30 December 1998 (1998-12-30) page 2, line 3 - line 15	11-13,19

1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 01/02263

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5974328 A	26-10-1999	NONE	
WO 9820698 A	14-05-1998	US 6208857 B	27-03-2001
		AU 5246798 A	29-05-1998
		EP 0938784 A	01-09-1999
		US 5946618 A	31-08-1999
		US 6073013 A	06-06-2000
		ZA 9709885 A	28-07-1998
WO 9859506 A	30-12-1998	SE 9702388 A	24-12-1998